

Claims

What is claimed is:

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1. A programmable control system, comprising:  
a processor for executing a control program;  
a shared memory storing data associated with the control program, at least one of data associated with sensing and actuating devices, and forced I/O values; and,  
an I/O processor for performing at least one of input and output functions, the I/O processor and the processor operatively coupled to the shared memory, the I/O processor operatively coupled to a cache memory storing at least a portion of the forced I/O values stored in the shared memory, the I/O processor storing input values in the shared memory based at least in part upon forced I/O values stored in the cache memory, the I/O processor determining output values based at least in part upon forced I/O values stored in the cache memory.
2. The programmable control system of claim 1, the processor sending a message to the I/O processor in the event a forced I/O value has been altered during execution of the control program, the I/O processor causing the cache memory to be refreshed in response to receipt of the message.
3. The programmable control system of claim 1, the I/O processor performing a blocked write to refresh the cache memory in response to receipt of the message.
4. The programmable control system of claim 1, the forced I/O values comprising at least one of binary and analog values.
5. The programmable control system of claim 1, the processor and I/O processing being coupled by at least one of a serial communications backplane bus, a parallel communications backplane bus and a network.
6. A programmable control system, comprising:

a processor for executing a control program;  
 a shared memory storing data associated with the control program and infrequently changed data; and,

an I/O processor for performing at least one of input and output functions, the I/O processor and the processor operatively coupled to the shared memory, the I/O processor operatively coupled to a cache memory storing at least a portion of the infrequently changed data stored in the shared memory, the I/O processor utilizing the infrequently changed data stored in the cache memory.

7. The programmable control system of claim 6, the infrequently changed data being at least one of I/O force data, configuration data, I/O fail safe information, a connection table, an output keep alive table and information associated with an input time-out.

8. The programmable control system of claim 6, the processor sending a message to the I/O processor in the event the infrequently changed data has been altered during execution of the control program, the I/O processor causing the cache memory to be refreshed in response to receipt of the message.

9. A programmable control system, comprising:

means for executing a control program;  
 means for storing data representing status of at least one of sensing and actuating devices, the means for storing further storing data associated with forced values for the at least one of sensing and actuating devices;

means for performing at least one of input and output functions, the means for performing at least one of input and output functions and the means for executing a control program operatively coupled to the means for storing data, the means for performing at least one of input and output functions operatively coupled to a cache memory means storing at least a portion of the data associated with forced values for the at least one of sensing and actuating devices, the means for performing at least one of input and output functions storing input values in the memory means based at least in part upon forced I/O values stored in the cache memory means, the means for performing at

least one of input and output functions determining output values based at least in part upon forced I/O values stored in the cache memory.

10. A method for forcing an I/O values in an industrial control environment, comprising:

loading a cache with forcing information associated with a forced input or output;  
receiving information associated with an input from a sensing device;  
retrieving information associated with an output to an actuating device; and,  
forcing the input or output based at least in part upon the forcing information loaded in the cache.

11. The method of claim 10, further comprising:

refreshing the cache if the forcing information is altered during control program execution.

12. The method of claim 10, loading the cache with forcing information comprising retrieving forcing information from a shared memory and loading the forcing information into the cache using an I/O processor.

13. The method of claim 12, retrieving forcing information from the shared memory comprising receiving a message in the I/O processor indicating that the forcing information in the shared memory has been altered, and refreshing at least a portion of the cache with the altered forcing information.

14. The method of claim 13, refreshing at least a portion of the cache comprising reading the altered forcing information from the shared memory and performing a blocked write to refresh the cache memory with the altered forcing information.

15. The method of claim 12, forcing the input comprising providing a forced input to the shared memory based on the forcing information using the I/O processor.
16. The method of claim 12, forcing the output comprising providing a forced output to the actuating device based on the forcing information using the I/O processor.
17. A method of selectively forcing I/O in a control system having an I/O processor and a control processor associated with a shared memory, the method comprising:
- selectively storing a forced input value to the shared memory according to forcing information in a cache associated with the I/O processor;
  - selectively providing a forced output value to an actuating device according to the forcing information in the cache using the I/O processor; and
  - obtaining altered forcing information from the shared memory using the I/O processor and storing the altered forcing information in the cache according to a message from the control processor.
18. The method of claim 17, storing the altered forcing information in the cache comprising refreshing the cache by writing the altered forcing information to a virtual memory location.
19. The method of claim 17, comprising writing the altered forcing information to the shared memory and sending the message to the I/O processor using the control processor, the message indicating alteration of the forcing information in the shared memory.

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